AMENDMENTS TO THE SPECIFICATION

Please replace the first paragraph on page 2 with the following rewritten paragraph:

The mover 31 of the linear motor includes the permanent magnet units 32, 33 extending in a vertical direction and in which permanent magnets for a magnetic field are juxtaposed to each other on a lower surface of the table ~~38~~39. The stator 36 includes a fixed member 38 made of iron in an W-shape and fixed on a box-shaped stator frame 37, and an armature unit 35 secured on an inner side of the fixed member 38 by, for example, an adhesive. The armature unit 35 is constituted by a concentrated winding of an armature winding wire wound on the split core 34, the armature winding wire being provided such that the permanent magnet unit is sandwiched between the armature winding wires from both sides. Meanwhile, the mover 31 is slidably supported by a linear guide having a guide rail 40 and a slider 41 (for example, see Patent document 1).

Please replace paragraph [0004] bridging pages 3 through 6 with the following rewritten paragraph:

[0004]

In order to solve the problem, the present invention is structured as in the following.

~~The invention directed to a moving-magnet-type linear slider according to claim 1 is~~ According to a first aspect of the invention, a moving-magnet-type linear slider ~~having~~ includes a linear guide which movably supports and guides left and right sides of a table arranged parallel with and opposite to a fixed base wherein the linear guide includes a slider and a guide rail, a linear motor which reciprocally moves the table in a longitudinal direction over the guide rail relative to the fixed base, and detecting means for detecting a relative position of the table and the fixed base, characterized in that the linear motor comprises an armature having an multi-phase armature winding wire wound on an armature core serving as a magnetic circuit fixed on the fixed base, and a permanent magnet for a magnetic field, the permanent magnet being attached on the table and arranged opposite to the armature interposing a magnetic gap, the detecting means comprises a linear scale ~~portion~~ fixed to the

table, and a sensor head ~~portion~~ which detects the linear scale, the a sensor head portion being attached on a fixed base side, and the armature is arranged such that a thrust center axis where a thrust of the armature is generated is substantially coincident with a center axis of a space between the left and right guide rails.

~~The invention according to claim 2 is characterized in that, in a moving magnet type linear slider according to claim 1,~~ According to a second aspect of the invention, as set forth in the first aspect of the invention, a the moving-magnet-type linear slider further includes a magnetic-pole detector which detects a relative position of the armature and the permanent magnet for a magnetic field ~~is structurally~~ arranged on an opposite side of the linear scale, wherein the magnetic-pole detector includes a hall element ~~constituting a part of the magnetic pole detector is~~ fixed on the fixed base side, and a magnetic-pole detector ~~permanent~~ magnet ~~constituting another part of the magnetic pole detector is~~ fixed on the table side so as to have an equal pitch as the permanent magnet for a magnetic field.

~~The invention according to claim 3 is characterized in that, in a moving magnet type linear slider according to claim 1,~~ According to a third aspect of the invention, as set forth in the first aspect of the invention, the fixed base is provided with a mounting hole for attaching the moving-magnet-type linear slider to an external apparatus, wherein the mounting hole is formed in a position outside or inside of the guide rail.

~~The invention according to claim 4 is characterized in that, in a moving magnet type linear slider according to claim 1,~~ According to a fourth aspect of the invention, as set forth in the first aspect of the invention, the sensor head ~~incorporates~~ includes a serial-signal conversion circuit which converts ~~a magnetic pole detection signal and~~ a scale signal of the linear motor output from the detecting means into a serial signals.

~~The invention according to claim 5 is characterized in that, in a moving magnet type linear slider according to claim 1 or 4,~~ According to a fifth aspect of the invention, as set forth in the fourth aspect of the invention, the sensor head has a memory into which a motor parameter of the linear motor is input, wherein, when the linear slider and a driver are connected together, the motor parameter is also converted into a serial signal by the serial-signal conversion circuit, ~~thus providing a contrivance to transmit~~ and the serial signal is transmitted to the driver.

~~The invention according to claim 6 is characterized in that, in a moving-magnet-type linear slider according to claim 1,~~ According to a sixth aspect of the invention, as set forth in the first aspect of the invention, the linear scale mounts thereon an absolute-type encoder which detects an absolute position signal of the linear-motor mover.

According to a seventh aspect of the invention, as set forth in the second aspect of the invention, the moving-magnet-type linear slider further includes a serial converter which converts a scale signal of the linear motor output from the detecting means and a magnetic-pole detection signal output from the magnetic-pole detector into serial signals.

According to a eighth aspect of the invention, as set forth in the seventh aspect of the invention, the sensor head has a memory into which a motor parameter of the linear motor is input, wherein, when the linear slider and a driver are connected together, the motor parameter is also converted into a serial signal by the serial converter, and the serial signal is transmitted to the driver.

Please replace paragraph [0005] bridging pages 6 and 7 with the following rewritten paragraph:

[0005]

According to the first and the sixth aspects of invention ~~set forth in claims 1 and 6~~, pressure can be exerted to the linear guide by a magnetic attractive force of the permanent magnet for a magnetic field, and one surface of the field permanent magnet is firmly fixed on a mover table. Accordingly, design with high mover rigidity as well as high guide rigidity due to a linear guide pressurization is possible.

According to the second aspect of the invention ~~of claim 2~~, the provision of the magnetic-pole detector makes it possible to immediately detect a relative position of the linear armature and the permanent magnet for a magnetic field when turning on a servo, and thus simplifying a setup.

According to the third aspect of the invention ~~of claim 3~~, design is possible with small slider width by forming a mounting hole for a user.

According to the fourth, fifth, seventh and eighth aspects of the invention ~~of claims 4 and 5~~, a structure is provided so as to serial-transmit a motor parameter, in which information such as a motor constant is previously stored in a linear slider, and by inputting a driver parameter information to the driver when connected to a driver, immediate restoration to the previous status is possible when exchanged with another driver in case where a driver is exchanged due to a failure in the future.

Please replace paragraph [0009] bridging pages 8 through 11 with the following rewritten paragraph:

[0009]

Fig. 1 is a plan view of a moving-magnet-type linear slider showing a first embodiment of the present invention while Fig. 2 is a front sectional view taken along line A-A in Fig. 1.

In the figure, 1 is a fixed base, 2 is an armature, 3 is a table, 4 is permanent magnet for a magnetic field, 5 is a linear scale, 6 is a sensor head, 7 is a slider, 8 is a guide rail, 9 is a stopper, 10 is a motor lead, 11 is a linear-scale lead, and 12 is a driver.

Features of the present invention are as follows.

Namely, the moving-magnet-type linear slider is basically constructed with a linear guide which movably supports and guides left and right sides of the table 3 that is arranged in parallel with and opposite to the fixed base 1, the linear guide having the slider 7 and the guide rail 8, a linear motor which reciprocally moves the table 3 along the lengthwise over the guide rails 8 relatively to the fixed base 1, and detecting means for detecting a relative position of the table 3 and the fixed base 1. The linear motor is constructed with the armature 2 having a multi-phase armature winding wire wound over an armature core serving as a magnetic circuit fixed on the fixed base 1, and a plate-formed permanent magnet 4 for a magnetic field attached on the table 3 and arranged opposite to the armature 2 interposing a magnetic gap. The detecting means is constructed with a linear scale 5 fixed on the table 3, and a sensor head 6 which detects the linear scale 5 and fixed on the fixed base 1 side.

Meanwhile, the armature 2 is arranged such that a thrust center axis where a thrust of the armature 2 is generated is placed substantially coincident with a center axis G-G of a

space between the left and right guide rails 8 when fixing onto the fixed base 1 and between the left and right guide rails 8 mounted on the fixed base 1.

Fig. 3 is a perspective view showing a ~~linear scale~~ sensor head 6 according to the invention.

In Fig. 3, 13 is a serial conversion circuit and 14 is a memory IC.

The sensor head ~~11~~ 6 incorporates a serial conversion circuit 13 which converts magnetic-pole-detection signal and scale signal of the linear motor into serial signals. Moreover, the memory IC 14 is provided and a motor parameter of the linear motor is input therein. When connection is provided between the linear slider and the driver 12, the motor parameter is also converted into a serial signal by the serial-signal conversion circuit 13, thus providing a contrivance to transmit ~~a~~ such serial signals to the driver 12.

Meanwhile, the stoppers 9 are provided on the fixed base 1 at front and rear regions of the guide rails 8 seen in a longitudinal direction, thus preventing the table 3 from overrunning.

Please replace the first paragraph on page 11 with the following rewritten paragraph:

[0010]

The operation is next explained.

As shown in Figs. 1 and 2, when the armature 2 of the linear motor is energized from a not-shown external power supply, the table 3 is reciprocally moved along the longitudinal direction of the guide rails 8 relative to the fixed base 1. On this occasion, when a relative position of the table 3 and the fixed base 1 is detected by the sensor head 6 provided on the fixed base 1 side relative to the linear scale 5 provided on the table 3 side, the serial conversion circuit 13 provided in the sensor head 6, as shown in Fig. 3, serial-converts and transmits the linear-scale signal, the magnetic-pole signal and the motor parameter stored in the memory IC 14 toward the driver 12. Based on the signals and the motor parameter transmitted to the driver 12 side, an accurate positioning of the linear motor by the driver 12 is performed.

Please replace paragraph [0011] bridging pages 11 through 13 with the following rewritten paragraph:

[0011]

Accordingly, the moving-magnet-type linear slider according to the first embodiment of the invention is constructed by the linear guide which movably supports and guides the table 3 with respect to the fixed base 1, the linear motor in which the permanent magnet 4 for a magnetic field is arranged on the table 3 side and the armature 2 is arranged on the fixed base 1, and the detecting means in which the linear scale 5 is fixed on the table 3 and the sensor head 6 is fixed on the fixed base 1 side. Therefore, an attaching area when fixing the permanent magnet 4 for a magnetic field on the table 3 side is large, and rigidity in the thrust-generating region can be increased.

Further, arrangement is made such that, when the armature 2 is fixed to the fixed base 1 between the left and right guide rails 8 mounted on the fixed base 1, the thrust center axis where a thrust based on the armature 2 is generated is placed substantially coincident with the center axis G-G of the space between the left and right guide rails 8, thus providing a structure in which a magnetic attractive force acting upon the permanent magnet for a magnetic field is applied to the linear guide as a pressurization. Therefore, an oscillation limit can be increased when increasing the control gain for response improvement, and a high-frequency speed ripple can be reduced.

Furthermore, by arranging the leads such as the motor lead 10 and the linear scale lead 11 on the stator side ~~from~~ in stead of arranging on the mover side, cable bear can be eliminated with respect to the moving-coil type.

Since the sensor head ~~11~~ 6 has a structure in which the serial conversion circuit 13 which converts magnetic-pole detection signals and scale signals of the linear motor into serial signals, large-capacity transmission is available as compared to a conventional pulse transmission, thus obtaining a linear driving system that has high speed and high resolving power. Incidentally, the present embodiment can improve the minimal-positioning resolving power ten times as compared to ~~a~~ the conventional pulse ~~sequence~~ transmission.

Please replace paragraph [0012] bridging pages 13 and 14 with the following rewritten paragraph:

Embodiment 2

[0012]

Fig. 4 is a plan view of a moving-magnet-type linear slider showing a second embodiment of the invention while Fig. 5 is a front sectional view taken along line A-A in Fig. 4.

In Figs. 4 and 5, 17 is a magnetic-pole detector magnet, 18 is a magnetic-pole detector head, and 19 is a serial converter.

In the first embodiment, when forming two parallel rows of mounting holes on the fixed base 1 for the user to attach the linear slider onto an external apparatus, mounting holes 15 for attachment of the linear slider to an external apparatus are provided on outer side of the guide rails 8. However, in the second embodiment, mounting holes 16 are provided in a space between an armature side surface and the linear guide in consideration that one-side coil end width is broadened by the effect of armature coil connection processing portion.

~~Therefore, in the second embodiment, the width dimension of the linear slider can be reduced by providing a structure in which the mounting holes are formed in an available space between the armature and the linear guide.~~

Please replace paragraph [0013] bridging pages 14 and 15 with the following rewritten paragraph:

~~Embodiment 3~~

[0013]

~~Fig. 4 is a view showing a structure of a third embodiment.~~

~~In the figure, 17 is a magnetic-pole detector magnet, 18 is a magnetic-pole detector head, and 19 is a serial converter.~~

On an opposite side of the linear scale 5, a magnetic-pole detector which detects a relative position of a ~~linear~~ armature ~~12~~ 2 and a permanent magnet ~~14~~ 4 for a magnetic field is arranged, in which the magnetic detector head 18 provided with a hall element is arranged

on a fixed-base 1 side, and the magnetic-pole detector magnet 17 is fixed on a table 3 side such that it is arranged to have a equal pitch as the permanent magnet 4 for a magnetic field.

A magnetic-pole detection signal output from the magnetic-pole detector is converted into a serial signal together with the scale signal output from the sensor head ~~16~~ 20 for the linear scale 5 by the serial converter 19, ~~and connected~~ and transmitted to the driver 12.

Therefore, in the second embodiment, the width dimension of the linear slider can be reduced by providing a structure in which the mounting holes are formed in an available space between the armature and the linear guide.

~~Accordingly, in the third embodiment~~Moreover, since the magnetic-pole detector for detecting an initial magnetic pole is provided on a side of the slider 7 ~~measurer portion~~ opposite to the linear scale, in which the detecting side (hall element) is fixed on the fixed base 1 while the magnetic-pole ~~sensor~~ detecting magnet 17 is fixed on the table 3, it is possible to immediately detect a relative position of the armature 2 and permanent magnet 4 for a magnetic field when turning on a servo, thus simplifying a setup.

Incidentally, it is preferable that a type in which an absolute-type encoder for detecting an absolute position signal of the mover be mounted on the linear scale 5 described in the embodiments. This can provide a linear slider that is easy to operate in which a zero-point return operation is not necessary when turning on a power source.